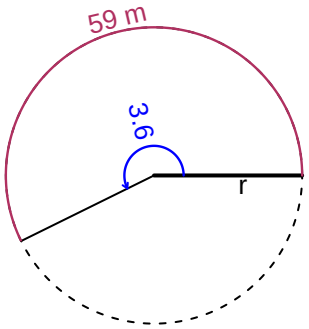
Name: Date:

Trig Final (Solution v32)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 59 meters. The angle measure is 3.6 radians. How long is the radius in meters?

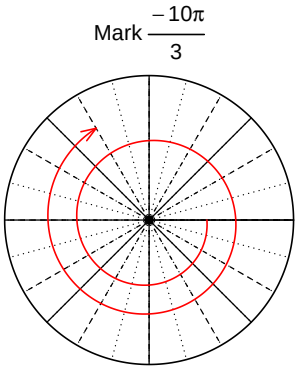


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

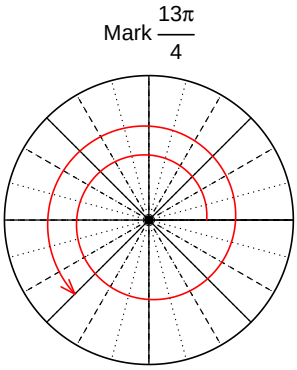
$r = 16.39$ meters.

Question 2

Consider angles $\frac{-10\pi}{3}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-10\pi}{3}\right)$ and $\cos\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-10\pi/3)$



Find $\cos(13\pi/4)$

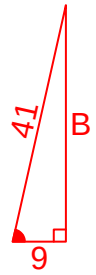
$\sin(-10\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-9}{41}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

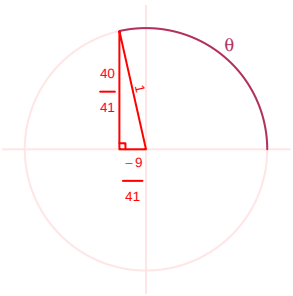
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$9^2 + B^2 = 41^2$$
$$B = \sqrt{41^2 - 9^2}$$
$$B = 40$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{40}{41}}{\frac{-9}{41}} = \frac{-40}{9}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -2.97$ meters, a frequency of 5.22 Hz, and an amplitude of 8.24 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.24\cos(2\pi 5.22t) - 2.97$$

or

$$y = 8.24\cos(10.44\pi t) - 2.97$$

or

$$y = 8.24\cos(32.8t) - 2.97$$